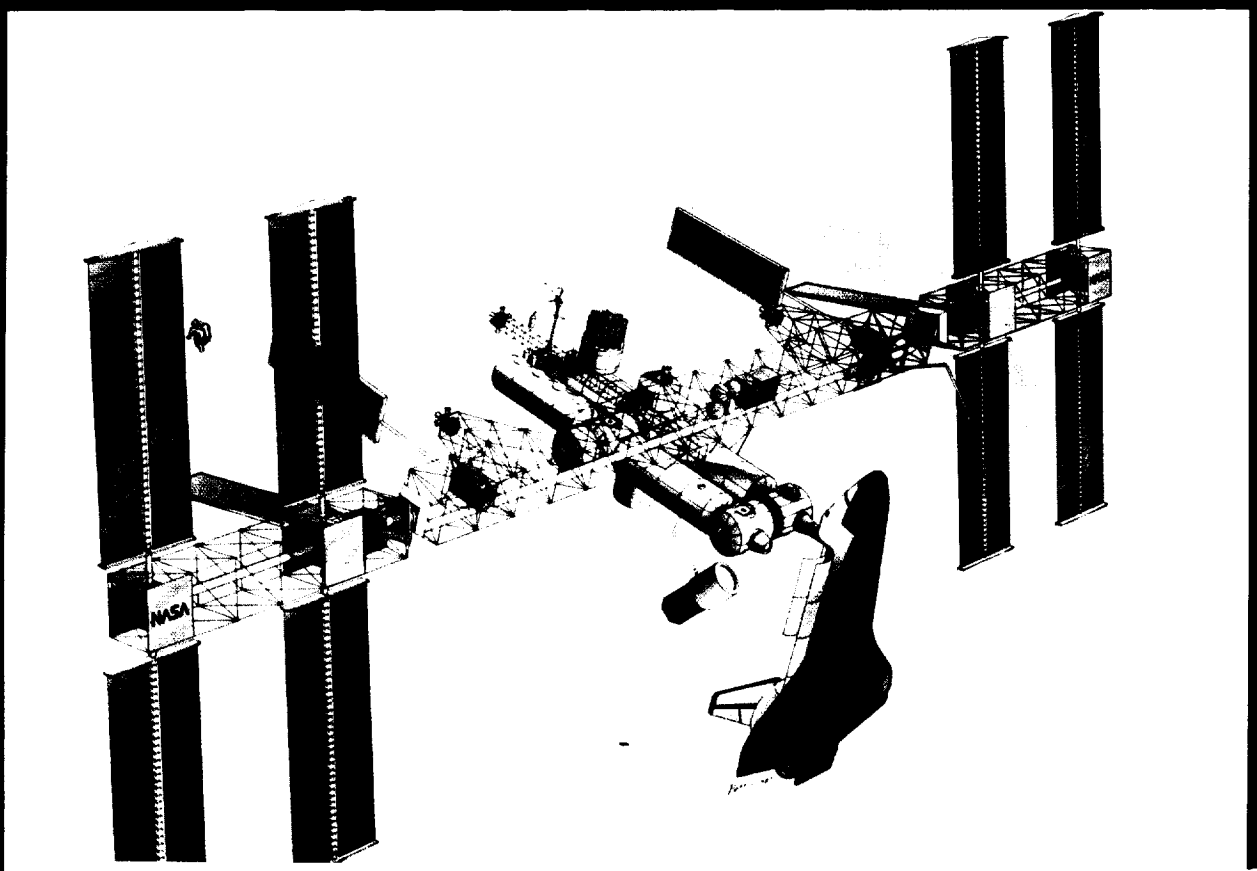
Nashville, Tennessee
3-5 November 1987

# Space Station WORKSHOP

## Issues And Recommendations






## Commercial Missions and User Requirements

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# INTRODUCTION

This document is divided into sections representing the three primary space discipline panels who participated in the Space Station Commercial Users Workshop, held November 3-5, 1987, in Nashville, Tennessee:

- Materials Processing in Space
- Earth and Ocean Observations
- Industrial Services

The 102 issues and recommendations which resulted from this Workshop have been categorized by each discipline subpanel. Responses to these issues and recommendations have been developed by NASA people whose expertise best qualifies them to address the topic. More than twenty interviews were conducted within the NASA Headquarters and Field Center organizations to complete these responses.

The responses contained herein represent the best answers available at this time. It should be understood, however, that certain issues, especially those involving policy matters, are continuing to evolve, thus some future modifications may be expected.

For your convenience, a point of contact is included in each response to obtain further information. A list of acronyms and abbreviations used throughout the text is also included on page ii of the document. Additionally, please note that the reference numbers (cited in parentheses following each item) refer to the page number and paragraph of the subpanel discussion contained in the Space Station Commercial Users Workshop Proceedings which was distributed earlier this year.

# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| CCDS | Center for Commercial Development of Space |
| Code C | Office of Commercial Programs (OCP) |
| Code E | Office of Space Science and Applications (OSSA) |
| Code EN | Microgravity Science and Applications Division |
| Code M | Office of Space Flight (OSF) |
| Code Q | Office of Safety, Reliability, Maintainability and Quality Assurance |
| Code R | Office of Aeronautics and Space Technology (OAST) |
| Code S | Office of Space Station (OSS) |
| FAR | Federal Acquisition Regulations |
| JEA | Joint Endeavor Agreement |
| JPL | Jet Propulsion Laboratory |
| JSC | Johnson Space Center |
| MODIS | Moderate-Resolution Imaging Spectrometer |
| MPS | Materials Processing in Space |
| MRDB | Mission Requirements Database |
| MSAD | Microgravity Science and Applications Division |
| OMB | Office of Management and Budget |
| SEM | Scanning Electron Microscope |
| STS | Space Transportation System |
| SURF | Space Ultra-vacuum Facility |
| USML | United States Microgravity Laboratory |

# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

## MATERIALS PROCESSING IN SPACE

## POLYMERS

**Item # 1:**
NASA should sponsor precursor polymer experiments in the following areas :

- Measurements of extensional viscosity in microgravity (Pg. 233, Par. 2);
- Spinoidal decompositions (Pg. 233, Par. 2);
- Copolymerization of monomers with varying reactivity ratios (Pg. 233, Par. 2); and
- Effects of microgravity on polymer foam production (Pg. 233, Par. 2).

**Response:**
NASA believes that polymer experiments are important and have far-reaching potential to industry. NASA is willing to sponsor polymer experiments consistent with agency policy. We are currently reviewing proposals for polymer experimentation from a polymer consortia. NASA is willing to review all industry or university proposals. New proposals should be addressed to Roger Crouch, NASA Office of Space Science and Applications. For further information, contact Roger Crouch at (202) 453-1490.

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**Item # 2:**
NASA should fly the existing MPS polymer experiments. (Pg. 234, Par. 5)

**Response:**
Allocation of flight space on the Shuttle will be consistent with the available space for experiments and corresponding flight priorities. Flight scheduling is based upon a qualitative assessment of the proposed experiments. Currently, the majority of MPS experiments are manifested as STS secondary payload missions. New proposals and the current backlog will be manifested as soon as possible in accordance with manifest policy which is currently under review at NASA Headquarters. For further information, contact Robert Rhome at (202) 453-1685.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 3:**
The fluid physics group should do non-Newtonian fluids experiments to study drop break-up and drop coalescence. (MPS Closing Plenary, Pg. 240, Par. 2)

**Response:**
NASA recognizes the importance of drop break-up and drop coalescence experiments. Hardware to conduct these experiments is under development and the experiments are scheduled during a USML mission to be conducted in early 1992. For further information, contact Robert Schmitz at (202) 453-1555.

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**METALS & ALLOYS**

**Item # 4:**
NASA should place a high temperature (>2000°C) furnace facility on board the Space Station for metals and alloys work. (MPS Closing Plenary, Pg. 240, Par. 3)

**Response:**
A Space Station furnace facility capable of conducting experiments above 2000°C will be available with the completion of the man-tended laboratory. The furnace is currently part of the microgravity Space Station plan. For further information, contact Mary Kicza at (202) 453-1490.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 5:**
NASA should perform research in the following areas: (MPS Closing Plenary, Pg. 240, Par. 3)

- porous foam - hollow spheres
- composite alloys - wetting
- precious metals catalysts
- metals and alloys characterization

**Response:**
NASA recognizes the importance of research in these areas and welcomes proposals from industry for these and other MPS research areas. Currently NASA is conducting research in a number of areas described below.

Porous Foam - Hollow spheres research is currently being conducted at JPL. The principal investigator is Donald Germann who can be reached at (818) 354-2812.

Composite Alloys - Wetting research is being conducted by Julian Szekely of MIT who can be reached at (617) 253-3236.

Precious Metals Catalysts - Research has primarily been conducted through the CCDS participants, including the Center for Advanced Materials, Battelle Columbus Laboratories, and the Center for Development of Commercial Crystal Growth in Space, Clarkson University.

Several studies are currently being conducted in the metals and alloys characterization area. Dr. John Margrave of Rice University is performing research on thermophysical property measurements in containerless facilities and can be reached at (713) 527-8101. A proposal on melt purification of indium has been submitted to NASA for review. Mark Lee - NASA Headquarters (202) 453-1490; Jim Allen - Jet Propulsion Laboratory (818) 354-4321; and Martin Glicksman - Rensselaer Polytechnic Institute (518) 276-6721 are all conducting research in the metals and alloys characterization area.

If you would like to do research in any of these areas, please contact Roger Crouch at (202) 453-1490.

# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

### BIOTECHNOLOGY

**Item # 6:**
The Biotechnology panel recommends placing more emphasis on meeting requirements rather than individual facilities, especially those related to:

- the study of macromolecular crystallization aggregation, synthesis, and assembly (Pg. 229, Par.2)
- cellular level studies: secretion, multiplication, interaction, and differentiation (Pg. 229, Par. 3)
- separation, purification, and fractionation of particles (Pg. 229, Par. 4)

**Response:**
NASA recognizes the concern for identifying biotechnology requirements. Upon completion of preliminary conceptual and design/development requirements definition for the Space Station facility, NASA will conduct an open workshop to solicit industry, government, and academic inputs to the final design. Interested parties should contact Dr. Robert Snyder at Marshall Space Flight Center, (205) 544-7805.

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**Item # 7:**
NASA needs to provide essential support such as waste handling, environmental health, and water. (Pg. 230, Par. 6)

**Response:**
Essential services such as waste handling, environmental health, and water are all provided as part of the Space Station lab module design. Requirements for these services are addressed in the Mission Requirements Data Base (MRDB) and are based on the requirements identified to NASA. For detailed specifications, contact Dan Herman at (202) 453-2027.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 8:**
NASA needs to examine various incentives and business issues. (Pg. 230, Par. 7 and 8)

a. the National Space Biotechnology Laboratory concept
b. tax incentives
c. protection of proprietary rights for existing space technology and future technological gains from space research
d. getting early FDA participation to help bring a space product at least to the head of the queue
e. the technical advantages through cooperative research activities
f. multidiscipline research and marketing opportunities via NASA-related companies
g. the incentive to spread the risk, which is the whole purpose of research
h. new proposals with innovation through the Centers for the Commercial Development of Space

**Response:**
NASA agrees with the need to address the various business and incentive recommendations stated above.

a. A National Space Biotechnology Laboratory appears to be a good idea and should be pursued. The biotechnology area is rapidly growing, changing, and evolving and it is difficult to plan experiments seven to eight years in advance. A National Space Biotechnology Laboratory would help to coordinate these activities.

b. Tax incentives for fostering commercial space activity is a topic which will be discussed by the Code C/Code S Steering Committee. Presently, it is unclear whether the effort required for legislation would be justified by the increase in commercial development. Furthermore, Congress, Department of Treasury & OMB would each have to approve changes to the tax code.

c. The issue of proprietary rights is of vital interest to industries concerned with developing commercial products or services. NASA understands the need to resolve this issue and acknowledges the need to protect a firm's proprietary data. This area will be addressed by the Code C/Code S Steering Committee to examine the requirements for meeting this need. For additional discussion, refer to item #65.

d. NASA strongly supports this recommendation. It would welcome FDA participation and will work for cooperation when a product comes to our attention. The issue of putting space products at the head of the queue is complex and will require FDA study.

e.-h. The CCDS program should provide an open channel for potential users of the Space Station to get involved. As part of their charter CCDS's should also continually act as an avenue for bringing in new research ideas and requirements.

The CCDS as a consortia is strongly influenced by the needs of its private sector affiliates. All CCDS's are looking for new and innovative ideas relative to their individual charters. In some instances (e.g. Ohio State's Center for Mapping), the CCDS actively solicits new proposals from outside the CCDS. Several of the projects sponsored by the CCDS program project a use of space facilities with long duration capability. All CCDS's would be delighted to talk with potential industrial affiliates about using space facilities (e.g. Space Station) and would, as a part of their normal activities, serve as a conduit to incorporate affiliate requirements for space facilities.

For further information, contact Barbara Stone at (202) 453-8720, or Janelle Brown to discuss the CCDS program at (202) 453-2116.

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**Item # 9:**
NASA should have an integrated analytical system on board the Space Station that allows module changes as requirements change. (Pg. 230, Par. 5)

**Response:**
The integrated analytical system is already incorporated into the design of the Space Station. NASA is currently planning to develop the system and will consider any proposals submitted. For additional information, contact Mary Kicza at (202) 453-1490.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

### COMBUSTION

**Item # 10:**
NASA should include provisions for metals combustion in the list of reference experiments currently being used. (Pg. 235, Par. 2)

**Response:**
NASA will include provisions for metals combustion on the list of reference experiments. NASA is presently waiting for experiment specifications from Mr. Hansel of Air Products & Chemical Co. and Mr. Maloney of Philip Morris, USA. For further information, contact Kurt Sacksteder, Lewis Research Center, (216) 433-2857.

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**Item # 11:**
NASA should support development of recycling technology such as "membrane separation technology." (Pg. 235, Par. 3)

**Response:**
No current research is being conducted in this area; however, NASA is willing to review proposals from industry interested in membrane separation technology. Taylor Wang of JPL is looking at spherical shells that can encapsulate cells. If this research is of interest, please contact him for further information at (818) 354-6331.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 12:**
NASA needs to explain how the concepts and requirements for the modular combustion facility will be included in the MRDB and how the MRDB will be periodically made available for review. [concern over access to MRDB] (Pg. 235, Par. 2 and 4)

**Response:**
NASA Code EN plans to provide inputs to the MRDB for all of its facilities before the Space Station Preliminary Requirements Review (PRR). The MRDB is currently maintained by the Space Station Program. Requests for MRDB information should be made to Dave Keldorf, Mission Planning and Analysis Division, NASA/JSC, (713) 483-8124.

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**Item # 13:**
NASA needs to provide a substantial database of low-gravity combustion phenomena to increase understanding of these phenomena and to inspire innovative ideas. (Pg. 235, Par. 1)

**Response:**
NASA agrees that there is a need for wide dissemination of experiment results for low-gravity combustion phenomena. Steve Speech, a Presidential Exchange Program executive from 3M, is developing a process and format to more widely distribute this information. Under this process, each discipline will pull together research results and disseminate them individually. For further information, contact Steve Speech at (202) 453-1490.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

### GLASSES & CERAMICS

**Item # 14:**
NASA should conduct basic research in glass fiber pulling. Industrial interest in glass fiber pulling cannot realistically be expected until some basic research has been conducted and some success is demonstrated. (Pg. 237, Par. 1)

**Response:**
NASA has discussed funding glass fiber pulling for quite some time; however, the primary issue is a lack of defined technology to do this research in space. NASA is willing to review proposals in this area and fund the basic research. Dick Parker of Lewis Research Center is interested in glass fiber pulling and can be reached at (216) 433-4000. For further information, contact Roger Crouch at (202) 453-1490, NASA Headquarters.

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**Item # 15:**
NASA should expand industry input in the glass and ceramic area by sending a mailing of current research to industry and initiating a follow-up program. (Pg. 238, Par. 2)

**Response:**
A follow-up program is needed to help expand industry input for glass and ceramic research.

The goal of glass and ceramics research is to use microgravity and modeling studies to gain an improved scientific understanding of glass formation and the processing and ultimate properties of vitreous and crystalline ceramics.

Microgravity's reduction in buoyancy and gravity-induced convection makes possible the investigation of high temperature melts in a containerless manner and the potential creation of glasses and ceramics that are ultrapure chemically and that have unique compositions, microstructures, and properties. Reduced gravity also makes it possible to isolate the effects of weak forces, such as surface and interfacial phenomena, so that they can be studied independently of gravity-dependent body forces.

The knowledge gained from research in space will lead to more efficient and novel processing methods on earth and to a firmer understanding of the ultimate limits of the engineering performance of glass and ceramic materials. The space exploration program itself will benefit from a science base enabling exploitation of in-space resource.

There is a substantial amount of ongoing activity in the area of glass formation, nucleation, and crystallization. Research on these topics is being pursued by Dr. E.C. Ethridge of Marshall Space Flight Center; Professor D.E. Day at the University of Missouri-Rolla; Professor R. Doremus of Rensselaer-Polytechnic Institute; and Professor M.C. Weinberg of the University of Arizona. A common objective of these containerless processing studies is to improve our understanding of nucleation and crystallization processes which occur on earth and to use that knowledge for designing space experiments which could lead to the formation of novel glasses, e.g., unique optical properties and superconducting glasses. Several compositions being studied are of particular interest because of their potential applications in optical and microelectronic devices.

Investigations are being pursued involving the crystallization behavior of fluoride glasses which have excellent infrared transmission, and are prime candidates for ultra-low-loss optical fibers (long distance telecommunications applications such as undersea lines as required by the Navy). Also, the glass forming ability and crystallization of lead borate glasses are being studied since these compositions have application as solder glasses in the sealing of integrated circuit chips and self-luminous plasma display devices. Glass forming ability for calcia-gallia and other compositions with interesting index of refraction-dispersion combinations (required for advanced optical devices) are also being investigated.

Containerless experimentation may be employed to perform high temperature property measurements on materials which would react and/or be contaminated by a container. Research in this area is being pursued by Drs. P.C. Nordine and R.A. Schiffman at the Midwest Research Institute and Professor J. Margrave of Rice University. Ground-based levitation systems are being utilized to obtain preliminary data on systems of interest. However, due to various restrictions of ground-based equipment (such as difficulties in levitating and manipulating certain molten materials), space experiments will be required for satisfactory exploration of the high temperature thermodynamic properties of these materials.

Optical glasses and many other glasses with high technology applications must be defect-free to be employable. However, during the glassmaking process gas bubbles are invariably generated in the molten glass. On earth, a common mechanism for bubble elimination is a buoyant microgravity environment. Thus, alternative means must be found to eliminate bubbles from glass melts in space. This problem is being addressed by Professor R.S. Subramanian of Clarkson University and Professor M.C. Weinberg of the University of Arizona. On the other hand, microgravity allows for the performance of a number of bubble related investigations in which gravity is a complicating factor. For example, Dr. P. Hrma, of Case Western Reserve University, is studying the behavior of foams. The production of foams entails a very complex process, and significant simplifications might be evolved by examination of this process in space where gravitational effects would be suppressed. A second illustration is given by the

fabrication of microballons used to encapsulate the fuel for nuclear fusion reactions, and thus must meet a number of stringent requirements concerning dimensionality and surface smoothness. Microgravity experimentation could help in understanding the mechanism by which microballons are formed. Research in this area is being pursued by Drs. Taylor Wang, Mark Lee, and others at the Jet Propulsion Laboratory. In addition, the shaping and fabrication of large (several millimeters) glass macroballons for initial confinement fusion targets is being investigated by Professor D.E. Day at the University of Missouri-Rolla in collaboration with Los Alamos National Laboratory.

Work at the Lewis Research Center has also been initiated in the area of phase separation in glasses by Mark J. Hyatt. The objective of this work is to study the effects of space processing on phase separating glasses. This could lead to glasses with unique microstructures and properties, and also furnish basic understanding of a process affecting many glass forming systems. The approach uses a convenient model system to explore the phase separation process under a range of gravity conditions, using ground-based facilities. The information thus gained will be used to model the phase separation process in a suitable glass system. Space experiments would then be carried out using this glass system, and the results compared with those predicted by the developed model of phase separation. Currently, investigations are underway to select a suitable system for the ground-based modeling studies

Ceramics-related research has had less program emphasis than glass related research and it is only during the past few years that several ground-based efforts have been initiated.

Professor James D. Cawley of the Ohio State University is studying the effects of microgravity on the agglomeration of powders in dilute aqueous solution in the research project entitled "Study of Powder Agglomeration in a Microgravity Environment." This work will result in an improved theoretical understanding of the agglomeration of powders that will be extremely beneficial to the materials industry. Current models of the agglomeration process are restricted to totally diffusing transport of power particles. A microgravity environment is therefore desirable because thermal convection currents and particle settling are eliminated, and particle motion is purely by diffusion. The research will involve the selection and characterization of three representative types of powder suspensions and the development of a light scattering analysis technique to probe the structure of the agglomerates. The results will be compared to a numerical computer model.

Professor William Russel and Dr. P.G. Debenedetti of Princeton are working on a program entitled "Disorder-Order Transitions in Colloidal Suspensions: Computer Simulations and Experimental Observations." The work combines theoretical and experimental studies of the dynamics of disorder-order phase transitions in concentrated collodial systems. The theoretical aspect involves the use of Browian dynamics computer simulations to study the irreversible process whereby a disordered, concentrated colloidal dispersion relaxes by forming an ordered

structure. In addition to this modeling, experiments with well characterized particles (silica spheres) under conditions similar to those being simulated will be conducted to test the influence of gravitational forces upon the phase transition. These experiments, which will involve the observation of the phase transition for one or more model systems, will lead to light scattering work on earth or the design of experiments to be performed in space. The work is related to the processing of ceramics because the dynamics of the phase transitions in colloidal dispersions are fundamentally important in determining the ultimate morphology of many densely packed systems formed in processes of technological relevance (sedimentation, ultrafiltration, slip casting).

The aim of the programs completed by Drs. Robert G. Behrens and Steven M. Valone, Los Alamos National Laboratory, was to determine the role of gravity in the formation of ceramics and alloys via the self-propagating high-temperature synthesis process. They examined the reactive fluid flow aspects of condensed phase combustion processes at microscopic and atomic levels via wetting experiments and numerical simulations. Wetting experiments of titanium on graphite have been conducted and photographically monitored. Numerical simulations of wetting, spreading, bubble entrapment, and break-up have been carried out. Based on results to date, the various studies show the role of microgravity is masked by wetting phenomena.

The topics of glass formation, glass containerless processing, glass firing, and glass thermophysical property measurements that are in or near flight status will hopefully be accelerated with resumption of flight experiments. Current topics such as particle sedimentation and agglomeration, glass foams, and glass phase separation appear to warrant continued support and consideration for eventual flight status.

Gas phase processing of glasses and ceramics has been employed for fabricating low-loss optical fibers and for producing microscale ceramic particulates which can be formed at low temperatures to produce extremely strong materials. Basic understanding of the science of several of the individual steps in these processes is lacking. Because this processing entails flows of hot gasses with large temperature and concentration differences, convective flows may be in evidence, which could warrant microgravity experimentation.

Glass making refers to the melting, chemical reactions, and mixing involved in converting crystalline powders into molten glasses via heating. Convective mixing, which can be extremely important in homogenizing a glass melt on earth, will be absent in space. Questions arise concerning the ability to produce compositionally uniform glasses in microgravity, particularly in instances where stirring is precluded because contact with foreign bodies during processing is forbidden. Research addressing this issue is specially important if glassy materials are to be fabricated in space for use in space.

Joining is the process by which glasses and ceramics are bonded to metals, polymers, composites, or each other. Gravity can affect the flow characteristics of the important liquid phases produced during joining and thus invalidate techniques that are successful in a gravity environment. Thus, joining of in-space structures may be an important area for future research and technology development.

In microgravity, especially in containerless experiments, surface tension and interfacial phenomena can be studied and utilized unimpeded. The properties of surface skins should be investigated, including the segregation and enrichment of components which substantially change the surface tension and properties of melts. Surface tension driven flows could be used for mixing and bubble elimination of molten glasses and ceramics.

All processes to produce glass of ceramic fibers involve the flow and subsequent "stiffening:" of a liquid phase. Typically, drawing of glass fibers is done from a fairly viscous molten liquid; hence, gravity has little influence upon the fluid flow. For fibers drawn from a fluid ceramics, the situation could be quite different and gravitational effects could be significant. Gaining a firm understanding of the phenomena involved is extremely important.

The formation of glasses is hindered not only by the nucleation and growth of crystals, but also by liquid-liquid and glass-in-glass phase separation. Phase separation is the process whereby a homogeneous mixture composed of two liquids separates into two distinct phases. On Earth, complete separation of the phases may occur. However, in space, sedimentation and agglomeration will be suppressed, and new glass or ceramic composite microstructures with useful properties might be achieved. The suppression of sedimentation in microgravity could result in a more uniform array of particulates and a broader range of particle sizes. Such multiphasic dispersions or composites can serve as transducers of mechanical, magnetic, optical, electrostatic, or chemical stimuli as well as structural materials.

Ceramics are composed of crystals or grains of ionic or covalent solids, that are one-tenth to one-hundred microns in size. Many ceramic properties -- light transmission, index of refraction, magnetization, dielectric constant, elastic modulus--are determined directly as the sum of these properties of the individual grains. However, in most solids, these properties vary with the direction in the crystal with respect to its crystallographic axes, i.e., the crystals are anisotropic. Further, the properties of the bulk (polycrystalline) body depend on whether the axes of the individual crystals are aligned, i.e., show some preferred orientation. The presence of a substantial orientation texture may yield unique properties and become an essential objective of ceramic processing. For example, ceramic superconductors need texture to carry high currents. One way to achieve texture in ceramic magnets is to impose a strong field during consolidation of the starting powders to align the individual grains. Once orientation is achieved, further processing, (compaction, sintering, annealing, etc.) does not destroy it. In nonmagnetic

materials, however, the task of achieving texture is much more difficult and the procedures are yet to be determined. Gravitational effects in larger particles may entirely override the extremely small torque in nonmagnetic materials. Consequently, microgravity may be the only means to obtain the desired texture in these cases.

Finally in support of terrestrial and microgravity science, fundamental transport property data are needed. Gravity can affect transport phenomena such as diffusion and heat transfer, which play a fundamental role in a large variety of processing operations. The overall difference occurring in microgravity needs to be established via precise physical property measurements that are available in a microgravity environment.

Progress in glass and ceramics technology is vital to the nation's competitiveness across a broad range of technologies including solid-state devices, ceramics for heat engines, and high-temperature superconductors.

Expansion and acceleration of the field of glass and ceramics microgravity research through resumption of Shuttle flights and the Space Station will contribute in tangible ways by means of benchmark space fabricated materials and less tangible, but equally important, contributions resulting from new knowledge and improved models.

NASA will investigate means of facilitating dissemination and follow-up activity for glass and ceramic research. Suggestions and comments on how to improve industrial opportunities/participation in the glasses and ceramics area should be directed to Steve Speech at (202) 453-1490.

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**Item # 16:**
A dedicated material science glove box is a "wished-for" entity on the Space Station. The powder press is not important in the early stages. (Pg.238, Par. 4)

**Response:**
The dedicated material science glove box (for MPS experimentation) is currently planned for the Space Station lab module and will be available with initial station occupation. Contact Robert Schmitz at (202) 453-1555, NASA Headquarters, for additional information.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 17:**
NASA and industry need more discussion to resolve waste handling and waste segregation for both toxic and nontoxic wastes. [Who has the responsibility?] (Pg. 238, Par. 5)

**Response:**
The responsibility for ensuring that user requirements become integrated into Space Station design rests with the Director of Utilization, Richard Halpern. NASA is currently in the process of reverifying user specifications to update the requirements not in the MRDB. For scientific applications, contact Code E at (202) 453-1490 or Code C for commercial applications at (202) 453-1123.

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**Item # 18:**
The NASA fluid physics discipline team should encompass chemical vapor deposition (CVD) and sputtering (coating studies) aspects of microgravity research in their work. (Pg. 238, Par. 6)

**Response:** NASA Code E is currently funding chemical vapor deposition research and Code C is funding MOCVD research. Discussions are currently taking place with the Japanese on a cooperative study effort. Diamond CVD studies funded by NASA Code R are also being conducted by Bruce Banks at Lewis Research Center, (216) 433-2308 .

Code E is currently not funding any sputtering (coating studies) research, but would welcome any experimental proposals in this area as well as chemical vapor deposition. For further information, please contact Roger Crouch at (202) 453-1490.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 19:**
NASA needs to provide reliable and rapid sample retrieval. Additional space and equipment on the Space Station will have to be designated for generic characterization studies. (Pg.238, Par. 7)

**Response:**
Technology for generic characterization studies is not sufficient at present. A further analysis is needed to better define characterization study and rapid retrieval requirements. Currently, it is mandatory to provide lab support equipment for initial characterization study. We need to understand user needs to determine the best approach. For further information, contact Mary Kicza at (202) 453-1490.

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**Item # 20:**
NASA needs to provide an on board SEM with X-ray Fluorescence for rapid experiment analysis. (Pg. 238, Par. 7)

**Response:**
This issue poses the same problem as Item #19. Technology and volume needs have not been clearly identified and the technology is not currently available. However, NASA is in the process of examining the feasibility for a Scanning Electron Microscope (SEM) as well as developing the functional requirements for the SEM. NASA welcomes comments and recommendations that may clarify the requirements. Please direct your response to Mary Kicza (202) 453-1490, NASA Headquarters.

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**Item # 21:**
NASA should investigate large scale space production of glass and polymer spheres. (Pg. 239, Par. 8)

**Response:**
NASA encourages industry participation in investigating larger scale production of glass and polymer spheres. There are many possible uses for glass and polymers. These uses must first be identified before large scale production can begin. Interested organizations should contact Mark Lee at (202) 453-1490.

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**Item # 22:**
The Microgravity Science and Applications Division fluid physics team should perform the chemical vapor deposition coating studies. (Pg. 239, Par. 8)

**Response:**
NASA is currently conducting CVD coating studies as part of the Fluid Physics Working Group Strategic Plan. (See item #18) For further information, contact Roger Crouch at (202) 453-1490.

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## ELECTRONIC MATERIALS

**Item # 23:**
NASA should establish a powered free flyer. (Pg. 236, Par. 1)

**Response:**
NASA believes that establishment of a free flyer is needed over the long term. NASA is in the process of drafting an RFP to solicit proposals for a Commercially Developed Space Facility. For further information, contact Lee Tilton at (202) 453-1144.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 24:**
NASA should develop a Space Ultra-vacuum Research Facility (SURF). (Pg. 236, Par. 1)

**Response:**
NASA is currently conducting preliminary studies on Shuttle and Space Station versions of a SURF facility. For additional information, please contact Robert Naumann at (202) 453-1490.

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**Item # 25:**
NASA should create a National Special Characterization Facility. (Pg. 236, Par. 1)

**Response:**
NASA would be interested in examining the relative merit of a National Special Characterization Facility. To do this, NASA will require additional information on the type of equipment required, location, and other amplifying details.

Please forward this information to Robert Schmitz at (202) 453-1555.

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**Item # 26:**
NASA should review and improve current peer review procedures. (Pg. 237, Par. 2)

**Response:**
NASA is presently reviewing the peer review procedures to establish a more effective and timely method. The basic issue being addressed is whether the review process should be done by committee or continue with the "mail peer review" process. The average proposal turnaround time is currently seven months; the goal is to reduce this turnaround time to three or four months. NASA is negotiating with an outside contractor to prepare the groundwork necessary to ensure that the peer review process is quick and efficient.

NASA encourages industry and government agency suggestions to improve this process. For further information, contact Roger Crouch at (202) 453-1490.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 27:**
NASA should deal with research funding for industry as a separate unit. (Pg. 237, Par. 2)

**Response:**
This issue is very complex due to the involvement of multiple government agencies, educational institutions, and industry. NASA is reviewing the selection process to better understand the reasons for establishing separate industry research funding. Questions concerning this matter should be directed to Kathryn Schmoll at (202) 453-1426.

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**Item # 28:**
NASA should not consider industry proposals competitive with those from academia. (Pg. 237, Par. 2)

**Response:**
Refer to Item #27 response. NASA is reviewing the selection process for industry proposals. Questions concerning this matter should be directed to Kathryn Schmoll at (202) 453-1426, NASA Headquarters.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 29:**
NASA should facilitate participation of small business in the space program. (Pg. 237, Par. 2)

**Response:**
NASA is fully supportive of developing small business opportunities in the commercial space program. NASA currently supports small business through the SBIR program. This program provides small business with seed and development capital to develop new capabilities/technology consistent with NASA goals and objectives.

NASA encourages small business involvement and is currently examining alternatives designed to support and stimulate involvement. This study is part of a multifaceted Code C initiative to examine new and innovative approaches for commercial uses of space.

We would welcome any suggestions on how to improve our responsiveness to small business needs. For further information, contact Harry Johnson at (202) 453-8341.

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**Item # 30:**
NASA should improve JEA processing procedures. (Pg. 237, Par. 2)

**Response:**
The Office of Commercial Programs, Code C, acknowledges the need to improve the JEA process. Code C is examining the requirements necessary to expedite this process by providing greater standardization and efficiency and possibly eliminating some past requirements. For further information on JEA policy matters, contact Barbara Stone at (202) 453-8720 or Jack Yadvish at (202) 453-2103.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 31:**
CCDS's need to be useful for a wider variety of needs. (Pg. 237, Par. 2)

**Response:**
The CCDS program is an experiment to encourage industrial involvement in space. As a consortia, they are striving to mold academic/industrial teams in a manner which best overcomes the deficiencies of each. The CCDSs are currently involved in a number of research areas and disciplines:

- space processing of engineering materials
- space vacuum epitaxy
- real-time satellite mapping
- space remote sensing
- commercial crystal growth
- space automation and robotics
- materials for space structures
- secretion research
- bioserve space technologies
- space power
- advanced space propulsion
- autonomous and man-controlled robotic and sensing systems

For further information contact, Janelle Brown at (202) 453-2116.

# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

### EARTH and OCEAN OBSERVATIONS

### ADVANCED APPLICATIONS

**Item # 32:**
NASA Code C should task someone to understand and identify market applications for pointable radar as a partial solution to data frequency and stereo needs on both the 28° platform and the polar platform. (Pg. 258,Par. 1)

**Response:**
This can be related to Item #41. Analysis of the advantages and disadvantages of pointing capability for a radar can be performed under the existing contract NAS13-293 Commercial Earth and Ocean Observation Mission Requirements. (NAS13-293 is a National Space Technology Laboratory {NSTL} contract for Teledyne Brown to develop commercial user requirements for the Space Station.) Most of the analysis carried out for low inclination could be extrapolated to polar orbit.

For further information, contact David Brannon at (601) 688-2043.

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**Item # 33:**
NASA and industry should identify mechanisms to encourage combined radar and visible imaging development for the 28° platform. (Pg. 258, Par. 2)

**Response:**
NASA agrees that this is a good recommendation and encourages it. If industry can provide a viable proposal, NASA Code EE will support it. NASA believes, however, that combining radar and visible imaging must first be looked at for the polar platform development. For further information, contact Shelby Tilford at (202) 453-1706.

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**Item # 34:**
NASA Code S should identify the pricing elements (costs and criteria for costs) for platform services. (Pg. 258, Par. 3)

**Response:**
NASA understands the importance of a clearly defined pricing policy to allow industry to adequately plan. NASA is in the process of developing a policy addressing the pricing strategies for standard and optional station services. This analysis will encompass all aspects to include the polar platform transportation and communication. The results of this analysis are due to Congress by September 30, 1988. For further information, contact Richard Halpern at (202) 453-1181.

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**Item # 35:**
NASA should add a new mission to the MRDB for a ground/ice probing radar. (Pg. 258, Par. 4)

**Response:**
NASA will welcome valid industry proposals for this system. If the proposal is commercially viable, NASA will support the effort. A ground/ice probing radar would be consistent with the 28° platform design and could be incorporated into Space Station development. For further information, contact Shelby Tilford at (202) 453-1706.

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**Item # 36:**
NASA needs to form an earth and ocean observations subgroup of the National Association of Space Station Applications and Utilization (NASSAU) to feed into the NASA system and to enhance NASA's understanding of industry's motivations and operations. (Pg. 258, Par. 5)

**Response:**
NASSAU is currently in the planning and organization phase. Plans are to include an earth and ocean observations subgroup to serve as the link between industry and NASA. For more information, contact Phil Culbertson at (202) 484-6048 or 484-8421.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 37:**
NASA needs to provide regulations and technology to allow a direct protected downlink to users from the platforms and include this downlink in the MRDB. (Pg. 259, Par. 6)

**Response:**
NASA fully concurs with this recommendation and plans to provide downlink capability. Protected downlink to users will be looked at on a case by case basis. For further information, contact Shelby Tilford at (202) 453-1706.

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**Item # 38:**
NASA should examine the possibility of allowing the direct downlink to be done commercially. (Pg. 259, Par. 6)

**Response:**
Direct data downlink is currently being proposed as a new MRDB entry by the Boeing/Peat Marwick Commercial Space Group. Licensing and frequency allocations are the main concerns as a commercial venture. The Boeing/Peat Marwick Group is in the process of identifying a commercial provider for this service.

For further information, contact David Brannon at (601) 688-2043.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 39:**
The federal government should clarify or modify current policy limiting satellite imaging data spatial resolution to enable U.S. domestic companies to compete internationally. (Pg. 259, Par. 7)

**Response:**
The Administration sent to Congress on January 25, 1988, a new space policy agenda in the form of a Commercial Space Policy. Although the nonclassified version does not specifically state what the new limits of spatial resolution are, numerous documents reference the five meter (in some cases "or lower") limit. This listing of the imaging resolution cap now makes U.S. policy consistent with the international norm and will allow U.S. companies (other things being equal) to compete internationally.

For further information, contact David Brannon at (601) 688-2043.

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**Item # 40:**
NASA should maintain the place holder mission (TDMX 2262) for manned observations. (Pg. 259, Par. 8)

**Response:**
NASA sees no commercial justification for this requirement. Since the capability exists for Space Station personnel to carry out manned observations, NASA is unaware of the rationale behind this requirement. NASA is willing to consider this recommendation if adequate justification can be presented. For further information, contact Shelby Tilford at (202) 453-1706.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 41:**
NASA should support COMM 1014 (Remote Sensing Test , Development, and Verification Facility) and ensure that it has a pointing capability. (Pg. 259, Par. 8)

**Response:**
Feasibility and concept development studies have begun for COMM 1014 under contract NAS13-293. (NAS13-293 is a NSTL contract for Teledyne Brown to develop commercial user requirements for the Space Station.) POP responses have been submitted by NSTL seeking to continue and expand this work.

For further information, contact David Brannon at (601) 688-2043.

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**Item # 42:**
NASA needs to examine the current polar platform servicing schedule. The current schedule is unacceptable. A proposed solution is to provide redundant sensors on the ESA as insurance. (Pg. 260, Par. 9)

**Response:**
NASA agrees that the current polar platform servicing schedule may be inadequate. However, it is not within the budget capability to improve that schedule at this time. The minimal service schedule will require sensor redundancy to meet requirements during a failure; however, it is too costly for total sensor redundancy. For further information, contact Shelby Tilford at (202) 453-1706.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 43:**
NASA must ensure that industry has the opportunity to access non-U.S. platforms. (Pg. 260, Par. 9)

**Response:**
NASA Code C feels this is a good idea and is supportive of it. The appropriate forum to address this issue and many other critical commercialization issues is currently in the process of being established. The Office of Commercial Programs is in the process of establishing a Commercial Programs/Space Station Steering Committee to examine these issues. The Steering Committee will improve the interaction between the Office of Commercial Programs and the Office of Space Station. For further information, contact Barbara Stone at (202) 453-8720.

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**Item # 44:**
NASA should provide industry with a policy for priority access (What are the criteria?) to the polar platform and 28° platform resources, including TDRSS. (Pg. 260, Par. 10)

**Response:**
NASA Code C agrees that this is a viable recommendation. As in Item # 43, this issue will best be addressed by the Code C/Code S Policy Working Group. For further information, contact Barbara Stone at (202) 453-2079.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 45:**
NASA should conduct future CEO level workshops on business and policy issues. (Pg. 260, Par.10)

**Response:**
The Office of Commercial Programs and its contractor, Boeing Aerospace Operations/Peat Marwick Main & Company (BAO/PMM), have developed a CEO-level brief for presentation to industry. In addition, the NASA/Office of Commercial Programs, Technology Utilization Division (NASA/OCP/TUD) is using its contract with Boeing Aerospace Operations/Peat Marwick Main & Company (BAO/PMM)--based on a three-year requirement ending October 1989--to provide technical and business marketing services for the purpose of informing, stimulating, and sustaining industrial interests in commercial space research and development. Under this contract, Boeing/Peat Marwick interacts directly with industry (i.e. meetings, briefings, conferences, seminars, and presentations) to communicate government policy and procedures as well as to provide business guidance in terms of the viability of a proposed commercial space venture.

In addition to the services provided by BAO/PMM, NASA/OCP/TUD maintains an Industrial Application Center (IAC) network consisting of ten Industrial and State Technology Application Centers located throughout the United States. Each IAC is chartered with regional responsibility to transfer and encourage the rapid commercialization of the Agency's technology by the private sector. In addition to responding to industry's continuing and changing need for information/technology transfer products and services, IAC's also participate in and promote commercial uses of space (CUS) activities through involvement in numerous educational, technical, and government (i.e. federal, state, and local) workshops, exhibits and presentations, trade association functions, and client services. IAC services combine technology search activities--access to the NASA technology and other data bases--and CUS marketing objective efforts to build relationship with the private sector. All 10 IACs maintain a calendar of events listing technical and business activities (e.g. Small Business Innovative Research (SBIR) Workshops, Industrial Trade Shows, TUD/CUS Workshops, and Technology Information System Training Seminars) and maintain a supply of marketing materials (i.e. brochures, flyers, posters, and other information items) for distribution to the public.

Both BAO/PMM and the IACs provide guidance to the private sector in the preparation of proposals for commercial space-related activities and provide assistance relative to the availability of government resources (e.g. facilities, hardware, and manpower support) and known costs, if any, to facilitate and expedite the processing of any cooperative effort with the government.

# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 46:**
NASA needs to commit early to the Geostationary (GEO) platform to support industry in the technology development required to deliver continuous real-time data capability that many advanced applications will require. Industry should be included on the GEO platform planning committees. (Pg. 260, Par. 11)

**Response:**
A science working group, which includes strong industry participation, has been established to look at what the platform requirements need to be. This requirements definition will be followed by a cost study to determine resource needs. However, before any commitment can be made, the budgetary issue must be addressed through the normal NASA channels. The GEO Platform is one component of the Sally Ride Report "Mission to Planet Earth" and most likely will not come to fruition before the year 2000. For further information, contact Shelby Tilford at (202) 453-1706.

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**Item # 47:**
NASA should explore government/industry sharing of instrument and data costs. (Addressing proprietary rights and co-funding issues.) (Pg. 260, Par. 12)

**Response:**
The recent issuance of NASA's EOS AO identified several mechanisms for sharing instruments and data costs. Scientific participation can be proposed in three areas of investigation: research facility instrument team member and team leader proposals, instrument investigation proposals, and interdisciplinary investigation proposals.

The issue of proprietary data rights is not being addressed in this AO. However, the NASA/Office of Commercial Programs Task Force on Commercial Uses of Space - Earth and Ocean Observations Steering Committee has identified this issue as one of the major limitations to establishing a competitive commercial remote sensing industry.

The Open Skies Policy of 1984 requires open access to remotely sensed data. Modifying this act would require modification and addition to existing legislation to change the impact of this policy on commercial opportunity.

For further information, contact David Brannon at (601) 688-2043.

# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 48:**
NASA should add the capability to provide analog data from both the 28° (electronic and film) and the polar platforms (electronic). (Pg. 261, Par. 13)

**Response:**
This capability already exists from the 28° platform. However, currently there is no consensus that electronic analog capability is adequate for the polar platform. All of the current working groups see no defined requirements as to how it would be used, but they are not ruling it out. NASA is willing to consider private sector recommendations for this service. For further information, contact Shelby Tilford at (202) 453-1706.

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**Item # 49:**
Establish a commercial analog data relay capability. (Pg. 261, Par. 13)

**Response:**
This can be included as a capability under Item #38.

For further information, contact David Brannon at (601) 688-2043.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

### RENEWABLE RESOURCES

**Item # 50:**
NASA should incorporate several key requirements for commercial users into the specifications of mission parameters. These issues include data rates and priorities of data rates from the platforms, repair priorities and schedules, provisions for direct data downlink, and information on additional commercial opportunities. (Pg. 262, Par.2)

**Response:**
With the exception of priorities, provision for data exists in the Mission Requirements Data Base (MRDB). Priorities will be addressed and negotiated individually for each mission. However, the Space Station should have provisions for various priorities/response times with associated cost schedules.

For further information, contact David Brannon at (601) 688-2043.

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**Item # 51:**
NASA should revise the MRDB for the LFC mission time frame and to correct spatial resolution from 14 x 25m to a 10 x 10m manageable size. (Pg. 262, Par. 3)

**Response:**
NASA does not plan to change the MRDB resolution description for LFC. The Large Format Camera is an existing instrument. Its resolution is determined by optical design, altitude, platform stability, and film characteristics. The numbers specified are for a defined set of conditions which can be extrapolated to other working conditions and, therefore, provide the information requested. Changes to the LFC to meet requested resolution could require major modifications resulting in additional cost.

For further information, contact David Brannon at (601) 688-2043.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 52:**
NASA should revise the MRDB to include an attachment for a pointable LFC mount. (Pg. 262, Par. 3)

**Response:**
NASA is willing to do this if resources are made available. If industry builds and uses a pointable LFC mount, NASA is willing to undertake the recommendation from industry in the interim. For further information, contact Shelby Tilford at (202) 453-1706.

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**Item # 53:**
NASA needs to increase the OCI spatial resolution in the region where MODIS is lacking from 500m to 200-300m to perform all imaging activities. (Pg. 262, Par. 3)

**Response:**
NASA agrees this is a valid requirement, but is having difficulty justifying it on an economic basis. Panels of scientists and users have looked at the complex trade-offs between high resolution and data in all areas and realized it is impossible to obtain both. If industry provides such an instrument and can make it commercially viable, NASA is willing to accept it. For further information, contact Shelby Tilford at (202) 453-1706.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

### NON RENEWABLE RESOURCES

**Item # 54:**
NASA needs to consider 10 areas of research opportunities in the non-renewable remote sensing area listed below. (Pg. 264 Par. 3)

(1) experimental radar with multi-frequency, multi-polarization variable depression angles
(2) experimental precision laser altimetry with high resolution registered optical imagery (GLARS)
(3) multispectral thermal IR
(4) narrow-band imaging spectrometer with tunable bands and bandwidth (5MM)
(5) passive fluorescent detection research
(6) detection of hydrocarbon seeps and spills (offshore and on land)
(7) parametric evaluation of solar illumination angle and plane of incidence
(8) capability for ice monitoring to support non-renewable resource development
(9) precision topographic mapping capability
(10) gravity satellite

**Response:**
NASA is currently conducting research in all of the areas listed above except (6) - detection of hydrocarbon seeps and spills. NASA is willing to accept proposals in all of these areas for consideration. The following addresses the current activity recommended in each research area:

(1) Synthetic Aperture Radar (SAR) addresses this area
(2) being considered at the present time
(3) being considered at the present time
(4) main objective of the High Resolution Imaging Spectrometer (HIRIS) program
(5) accomplished as part of the ACFT program
(6) willing to accept proposals
(7) HIRIS program addresses this issue
(8) looking at three techniques to accomplish this
(9) three working groups are studying this intensively
(10) phase B study is underway

For specific information on any of these research opportunities, contact Shelby Tilford at (202) 453-1706.

# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

### INDUSTRIAL SERVICES

### TRANSPORTATION SERVICES

**Item # 55:**
NASA should specify transportation service requirements (e.g., put an object into orbit) rather than specific hardware and configurations. Use a total package approach. (Pg. 286, Par. 2)

**Response:**
NASA fully concurs with this recommendation. It is consistent with the President's policy on acquiring space transportation through commercial vendors. NASA will support this policy. For further information, contact Barbara Stone at (202) 453-8720.

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**Item # 56:**
NASA should lease reusable space transportation services rather than developing and operating the technology-privatization of new or existing systems could be implemented. (Pg. 286, Par. 2)

**Response:**
NASA agrees with this recommendation to specify service requirements as opposed to hardware specifications and encourages it. Furthermore, NASA fully supports the President's Space Policy and Commercial Space Initiative which states "Federal agencies will procure existing and future required expendable launch services directly from the private sector to the fullest extent feasible." For further information, contact Barbara Stone at (202) 453-8720.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 57:**
NASA should standardize risk versus cost analysis within NASA. (Pg. 286, Par. 2)

**Response:**
A standard for risk versus cost does exist for man rated systems. Adherence to a risk standard is directed by Code Q Office of Safety, Reliability, Maintainability, and Quality Assurance.

Johnson Space Center implements the standard through the various NASA facilities.

For more information, contact Richard Storm at (202) 453-2783.

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**Item # 58:**
NASA should ease the process of accepting and acting on unsolicited proposals. (Pg. 286, Par. 2)

**Response:**

An unsolicited proposal by definition (FAR 15.501) is a written proposal that is submitted to an agency on the initiative of the submitter for the purpose of obtaining a contract with the government. It is not a proposal in response to a formal or informal request (other than an agency request constituting a publicized general statement of needs). The unsolicited proposal mechanism is not intended as a marketing tool for selling standard products and services to NASA. Indeed, a submission is not considered a valid unsolicited proposal (FAR 15.507) if its substance is available to the government without restriction from another source, if it closely resembles a pending competitive acquisition requirement or does not demonstrate an innovative and unique method, approach, or concept. Thus, most accepted unsolicited proposals are for research or unusual types of development, while offers to provide routine services or goods do not prosper. Acceptance of an unsolicited proposal must also comply with the Competition in Contracting Act (CICA), which generally requires preparation of a Justification for Other than Full and Open Competition (JOFOC) (FAR 6.302).

NASA currently has two initiatives which will make it easier for private sector organizations to bring their capabilities to bear on NASA's needs:

1. NASA Research Announcements (NRA). The NRA, a form of Broad Agency Announcement as authorized a FAR 6.102, will be used to regularize the process of bringing NASA's research needs to the attention of the public through CBD publication and to provide an

equitable and efficient structure for proposal evaluation. While NRA responses are classed as solicited proposals, they retain many of the advantages of unsolicited proposals in that the proposers are free to submit their own unique research proposals to meet the stated NASA need; the resulting competition is one of ideas. Multiple awards under a single NRA may be made. The NRA itself meets the competition requirement of CICA, so individual JOFOCs are not necessary. The NRA is now in use on a trial basis and will be formalized in the NASA FAR Supplement (NFS) in the near future.

2. Unsolicited Proposal Regulations. NFS Subpart 18-15.5, Unsolicited Proposals, is currently being revised to simplify proposal preparation and submission. Additional emphasis is being placed on effective internal proposal handling and control measures including the re-routing of unsolicited proposals directed to the wrong NASA institutional. A revised version of the publicly available brochure, "Guidance for Preparation and Submission of Unsolicited Proposals," is being prepared in conjunction with the revision to the unsolicited proposal regulations. Release of the documents will be coordinated with NRA release.

For further information, contact Bud Maraist at (202) 453-2105.

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**Item # 59:**
NASA should promote multiyear funding of space transportation procurements with minimum unit purchase guarantee. (Pg. 286, Par. 2)

**Response:**
This issue is discussed in Item #97.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 60:**
NASA should waive FAR requirements that give NASA rights to proprietary data. (Pg. 286, Par. 2)

**Response:**
The FAR and NASA's FAR Supplement enable a contractor to protect qualifying proprietary data by withholding the data from delivery to the Government and delivering form, fit, and function data in lieu thereof. However, when NASA has a need for proprietary data, contract provisions enable the contractor to deliver the data with limited or restricted rights. For further information, contact Bob Kempf, Associate General Counsel for Intellectual Property, at (202) 453-2424.

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**Item # 61:**
NASA should encourage the formation of consortia to undertake high risk commercial projects. (Pg. 286 Par. 2)

**Response:**
One of NASA's initiatives is to help mitigate the high risk in commercial space ventures in the formation of the CCDS program. In the last three years, NASA has awarded sixteen CCDS grants to support various commercial space research and development projects. For further information, contact Janelle Brown at (202) 453-2116.

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## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 62:**
NASA should create a space transportation "post office" that purchases all forms of space transportation to drive down the cost and expand the market. (Pg. 286, Par. 2)

**Response:**
NASA supports the President's policy to "...procure existing and future required expendable launch services directly from the private sector...." Requests for space transportation to meet NASA requirements are made through standard NASA RFP procedures published by the NASA Office of Procurement.

NASA Code M, Office of Space Flight, provides customer service to identify ELV or STS launch requirements. Once identified, a commercial user would then negotiate their own contract for that service, either with NASA in the case of the STS or with the private transportation vendor for ELV service.

NASA believes in fair and open competition and the right for anyone to compete in the competitive process. NASA does not believe that a "post office" would increase market size, resulting in decreased cost. NASA believes that the competitive process will achieve this through increased market awareness, stimulation, and need.

For further information, contact Mike Smith at (202) 453-1900.

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**Item # 63:**
NASA should establish an outreach program to inform nonaerospace corporations about space transportation opportunities. (Pg. 286, Par. 2)

**Response:**
NASA's Office of Commercial Programs is restructuring its outreach effort to establish an integrated multitiered approach aimed at multiple levels of an organization. This multitiered approach will include a CEO-level briefing, as well as technical workshops/symposiums. In addition to focusing on specific companies or industries, Code C will conduct a broad outreach program to stimulate a wide range of industry. Nonaerospace corporations interested in conducting research or providing a service will be invited to participate. Information on necessary services including space transportation will be provided to assist nonaerospace corporations in utilizing the space environment. For further information, contact Jim Ball at (202) 453-1922.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 64:**
NASA should establish a big brother program between established aerospace firms and non-aerospace firms. (Pg. 286, Par. 2)

**Response:**
NASA will eagerly support nonaerospace firms by assisting them in making contacts with the experienced aerospace firms. We will also provide liaison between firms conducting mutually beneficial research. However, arrangements beyond initial contact must be based on sound business principles. The establishment of a Big Brother program, if restricted to providing initial liaison between nonaerospace firms, can be a useful service to emerging space firms. NASA will investigate the merit and resource requirements associated with providing this service. For further information, contact Harry Atkins at (202) 453-1900.

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**Item # 65:**
NASA should issue idea patents (internal and external) with an initial option payment to ensure that the company is credible and committed to the idea. Idea patents would protect proprietary ideas presented to NASA for consideration from being disclosed in a RFP. (Pg. 286, Par. 2)

**Response:**
There is no such thing as an idea patent and NASA has no authority to issue one; Title 35 U.S.Code. However, the issue appears to be one of protecting unsolicited proposals.

NASA uses unsolicited proposals only for evaluation or review purposes, unless otherwise specified by law. The handling of unsolicited proposals is addressed in the NASA FAR Supplement, Subpart 18-15.5.

The disclosure of information concerning trade secrets, processes, operations, style of work, apparatus and other matters contained in an unsolicited proposal by a Government employee, except as authorized by law, may result in criminal penalties under 18 USC 1905.

For further information, contact Bob Kempf at (202) 453-2424.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 66:**
NASA should create a clearinghouse of potential projects that have been rejected for funding by traditional federal funding avenues. (e.g., OMB turns down a NASA project.) These projects could be pursued by industry. (Pg. 286, Par. 2)

**Response:**
The Technology Utilization Division, Office of Commercial Programs, historically receives proposals from NASA Field Centers for potential commercial applications projects involving NASA technology. These projects are reviewed by NASA Headquarters and the mission agency (when appropriate) with respect to the area(s) of commercial and/or institutional applications. If selected for funding, these projects are handled through Headquarters, cognizant NASA Field Center offices and the mission agency associated with the project under an interagency agreement or Memorandum of Understanding. If not selected, the NASA Field Center that proposed the project still has the option of pursuing it through other channels depending on its Center management policy. Technology Utilization (TU) officers at the various NASA Field Centers are often in the best position to recommend such opportunities. Additionally, NASA has a publication entitled "NASA Tech Briefs" which is available to the public upon request--10 volumes annually. This publication contains articles of approximately two pages in length describing NASA research and development accomplishments which are available for technology applications. The Technology Utilization Office at the NASA Scientific and Technical Information Facility (STIF) distributes this publication free upon request. Telephone the Technology Utilization Office at STIF (301) 859-5300 or write to P.O. Box 8757, BWI Airport, MD 20240, to be placed on the mailing list. For further information on the foregoing, contact Henry Clarks at (202) 453-8722. Should the specific interest be in potential space transportation commercialization projects, the Commercial Development Division, Office of Commercial Programs would be the organization with responsibility for pursuing such commercial interests. Accordingly, contact Ray Whitten at (202) 543-1888.

# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 67:**
NASA should ensure parity between commercial and government requirements for mission licensing agreements. (Pg. 286, Par. 2)

**Response:**
Licensing agreements for space transportation is the responsibility of the Department of Transportation. The concern about parity between commercial and government requirements for mission licensing agreements is not fully understood. NASA will welcome any further discussion on this topic to address specific concerns. Please contact Barbara Stone at (202) 453-8720.

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**Item # 68:**
NASA should include commercialization goals in the performance evaluations of NASA employees. (No reference)

**Response:**
NASA agrees that commercialization goals are important when evaluating personnel that are involved with the commercialization process. Many NASA employees, however, are not involved with this process and are evaluated according to their specific job requirements.

The NASA performance evaluation system is based on a personalized agreement made between employees and their supervisors. Specific goals are established to meet job related requirements.

NASA will support the commercialization effort by making supervisors aware of the need to identify commercialization goals if appropriate. For further information, contact Franklin Sutherland at (202) 453-2606.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 69:**
The Government procurement process is long and cumbersome. NASA should seek ways to improve this process. (Pg. 287, Par.3)

**Response:**
NASA is constantly seeking ways to improve the procurement process. We strive to improve both the quality of our procurement product (i.e., the solicitations and contracts we produce) as well as to decrease both the complexity and lead time associated with the procurement process. Such improvement must, however, be accomplished within the framework of law, regulation, and oversight under which we operate. That framework is not oriented toward speed or flexibility or even efficiency; the primary thrust of the framework is to safeguard the taxpayers monies and to further the goals established by Congress and the President.

While private industry is free to accomplish its procurement activities in a relatively unfettered manner, government procurement activities are severely constrained. This constraint has always been greater in the government than in private industry, but lately the level of contracting has grown at an ever increasing pace. Examples such as the Competition in Contracting Act, with its stringent requirements for specific approvals for "other than full and open competition," abound in the government contracting world. Social goals unrelated to the product being acquired, as well as funding constraints imposed by budget realities and political considerations, all work together to make the process more complex and time consuming than any of us would like. On the other hand, the record for honesty, integrity, and taxpayer confidence enjoyed by our government procurement personnel compares favorably with that of any other government.

Within NASA, we have undertaken a number of improvements in our procurement organization designed to streamline the procurement process. Recently, we completed the initial implementation of Automated Document Generation system which will significantly reduce the time required to produce a solicitation document. We have accomplished an automated Commerce Business Daily synopsis computer program, which helps speed synopsis input time and cuts delays encountered in getting synopses into the Commerce Business Daily. We have increased dollar thresholds for a variety of reviews accomplished at the Headquarters level, delegating greater authority to our Field Centers and reducing the oversight burden and time delays experienced by those activities. We have initiated automated management information programs which facilitate problem identification and effective management intervention; such effective intervention should improve lead times. We have energized an active in-house management oversight effort through the use of Procurement Surveys professional teams composed of Headquarters and Field Center experts who identify problems experienced by contracting organizations, and who offer assistance to facilitate improvement. One of the items our Surveys will emphasize in their review is lead time improvements. We are currently rewriting our Source Evaluation Board Manual to update and improve the procedures employed

in source selection. We are specifically addressing techniques which can be employed to ease the procurement process. It is our intent, upon completion of that manual, to offer to industry a seminar on NASA Source Selection to improve the understanding of our procedures. We are also currently rewriting our regulations which implement OMB Circular A-109 on Major Systems Acquisition. This revision is intended to improve the procedures currently used by NASA for such major acquisitions. One of the likely improvements which will result is the movement downward of Source Selection Official authority so that greater source selection will occur at Field Center or Associate Administrator level, rather than at the highest levels within the Agency. We have recently begun the use of Business Strategy Panels, high level acquisition reviews accomplished early in a program's development, which identify problems and develop solutions more quickly than before. Results have been encouraging and we intend to increase its use in the future.

While these and other techniques have been developed by NASA over the past few years, we seek to further improve our performance. While we are justifiably proud of the record we have established and our reputation in the procurement field, we are anxious to move ahead in other areas. To that end, we seek input from industry on how to best accomplish such activities. Such input should identify the problem being faced by industry, and should, if possible, make a recommendation for improvement. Unfortunately, we seldom receive such input from industry. Generalized statements that recommend that we "...seek to improve the process..." or which recommend that we "...get Congress to change the procurement laws..." are not as helpful as specific problems or issues which we can act upon. We do not intentionally make the procurement process difficult for private industry, and we will sincerely seek improvement where we are inadvertently causing unnecessary difficulty, but industry must assist us in this process through clear communication of what and how the process should be improved.

For further information, contact Bud Maraist at (202) 453-2105.

# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 70:**
NASA should be more receptive to change and accept non-NASA control of space assets. Control of assets is a key element of commercialized operations. (Pg. 287, Par.3)

**Response:**
NASA supports this recommendation with regard to commercially provided assets and will examine implementation requirements. This issue will be reviewed by the Code C/Code S Steering Committee. For further information, contact Barbara Stone at (202) 453-8720 or Kevin Barquinero at (202) 453-2563.

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**Item # 71:**
NASA's strategic planning is adequate but not articulated to industry on a consistent basis. NASA should prepare long range strategic plans and identify technical thrusts. The plans should be distributed to industry so that companies can better plan their business in this area. (Pg. 287, Par.3)

**Response:**
The NASA strategic plan is an internal, controlled document and not for dissemination. Every two years NASA does prepare a long range plan entitled: "NASA's Programs and Institutional Planning for FY89 and Later." The plan is noncommittal and void of budget projections but does provide NASA planning information. For further information, contact the NASA Associate Administrator for Policy and Planning at (202) 453-1033.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

### GROUND SERVICES

**Item # 72:**
Any product that will be marketed to non-NASA users must still have NASA's seal of approval. (Pg. 287, Par.3)

**Response:**
Code C is supportive of this recommendation and agrees in principle with this concern. In situations that affect safety or require system integration, NASA must have a seal of approval. For further information, contact Stacey Edgington at (202) 453-2079.

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**Item # 73:**
The Office of Commercial Programs (OCP) should encourage development of zero-gravity robotics technology in the near term and establish an agreement between industry and OCP for this activity. (Pg. 288, Par. 1)

**Response:**
OCP is currently sponsoring two CCDSs in the automation and robotics discipline to develop robotics for commercial space applications. OCP will emphasize more automation and robotics in future CUS activities. For further information, contact Janelle Brown at (202) 453-2116.

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**Item # 74:**
OCP should encourage Commercial Uses of Space (CUS) activity in robotics workshops sponsored by NASA and other organizations in industry and government. (Pg. 288, Par. 1)

**Response:**
NASA encourages increased activity in this area. We will support industry initiatives to develop the use of robotics in CUS initiatives. For further information, contact Ray Whitten at (202) 453-1888.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 75:**
OCP should discuss the potential marketing of TMIS access service with the Office of Space Station. (Pg. 289 , Par. 2)

**Response:**
This issue will be addressed as part of the Code C/Code S Policy Working Group. For additional information, contact Stacey Edgington at (202) 453-2079 or Kevin Barquinero at (202) 453-2863.

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**Item # 76:**
OCP should initiate discussions to explore the relative merits of establishing a Space Station operations agency or company. (Pg. 289, Par. 3)

**Response:**
The Office of Space Station is currently planning on operating the Space Station to include the incorporation of Station evolutionary upgrades. The Space Station Operations Task Force prepared a detailed study of the tasks and organization for Space Station operations. This document outlines the responsibilities and task areas required.

NASA will, however, evaluate the merits of a separate, possibly commercial operations agency or company as part of the Space Station commercial infrastructure contract.

For further information, contact Kevin Barquinero at (202) 453-8712.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 77:**
NASA should develop a top level requirements definition document for hazardous materials processing at launch sites. The subpanel will submit recommendations to NASA by February 15, 1988. (Pg. 289, Par. 4)

**Response:**
NASA is currently examining the materials processing hazardous requirements both at the launch site and in space. NASA will welcome industry proposals and recommendations on this topic and will evaluate the relative merit of this service being provided commercially. We look forward to reviewing the subpanel's recommendations. For further information, contact Kevin Barquinero at (202) 453-8712.

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**Item # 78:**
NASA should meet with the FCC and major satellite communications companies to explore the potential and develop a market strategy for commercial capability to provide communications to and from ground and LEO via satellite. (Pg. 289, Par. 5)

**Response:**
While a commercialized data relay satellite system is a feasibility, there is a large monetary investment that would be necessary by industry. A market survey and the appropriate marketing strategy would have to be developed up front.

The present set of TDRSS spacecraft is expected to provide support to the user community into the late 1990s. This includes the ability to meet the requirements of the Space Station Base, Platforms, and numerous free-flyers in the mission model. In addition, the European and the Japanese Space Agencies are planning data relay systems conceptually similar to the TDRSS. A panel has been formed to examine interoperability potential among the systems thereby reducing TDRSS loading.

To prepare for the 21st century, we are conducting preliminary studies for an advanced TDRSS that will meet the needs of the current and new generations of missions. It is feasible that a commercialized system could be developed that would provide the necessary support. The monetary investment would be very significant and the results of a market survey would be a major factor.

For further information, contact Eugene Ferrick at (202) 453-2030.

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 79:**
NASA and the telecommunications industry should jointly explore the market potential and feasibility of communications to and from ground to LEO via ground stations. (Pg. 289, Par. 6)

**Response:**
Currently, NASA does not know the viability of commercially provided ground based communications service to and from LEO. At present, the Air Force as well as the major system providers deliver that service. NASA will, however, entertain proposals from industry and if feasible, support this effort. For further information, contact Ray Arnold at (202) 453-1510.

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**Item # 80:**
NASA needs to recognize the commercial services option in operational planning. The Ground Services subpanel will develop a recommendation to the OCP, concerning NASA and industry roles by March 1, 1988. (Pg. 290, Par. 7)

**Response:**
NASA recognizes the value and options presented through the incorporation of commercial services options. Further analysis will be required before implementation. This analysis will be conducted by an independent Level I contractor. The Space Station program will be organized to provide commercial opportunity across the board. We look forward to reviewing the Ground Services subpanel recommendation. For further information, contact Kevin Barquinero at (202) 453-2863.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 81:**
The Ground Services subpanel will develop a top level requirements definition aimed at developing a preferred parts lists of space qualified components. This document will be presented to the OCP by February 15, 1988. (Pg. 290, Par. 8)

**Response:**
NASA looks forward to receiving this document. It will serve as a useful reference function as well as provide commercial providers and experimenters with hardware planning information. Please forward this document to Stacey Edgington at (202) 453-2079. For further information, contact Kevin Barquinero at (202) 453-2863.

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**Item # 82:**
The Ground Services subpanel will develop a top level requirements definition document for integrated training for presentation to the OCP. (Pg. 290, Par. 9)

**Response:**
NASA looks forward to reviewing the Ground Services subpanel requirements definition for integrated training. NASA will review all industry recommendations for commercial options aboard the Space Station.

For more information, contact Stacey Edgington at (202) 453-2079 or Kevin Barquinero at (202) 453-2863.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 83:**
The sub-panel will develop a top level requirements definition document toward developing post flight receiving capabilities. This document will be presented to the OCP by June 15, 1988. (Pg. 290, Par. 10)

**Response:**
NASA is willing to accept unsolicited proposals for all commercial options. We look forward to reviewing the Ground Services panel requirements definition for post flight receiving capabilities.

For additional information, contact Stacey Edgington at (202) 453-2079 or Kevin Barquinero, (202) 453-2863.

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**Item # 84:**
NASA should assemble a summary of literature on innovative launch facilities and outline the related technical concepts and work with interested organizations to work out NASA/Space Station interfaces, communications, etc. (Pg. 290, Par. 11)

**Response:**
NASA concurs that an all inclusive listing of conventional and innovative launch facilities would be a useful tool. Currently, such a document does not exist. We will examine the possibility of developing such a document.

Commercial organizations interested in interfacing with NASA should contact Code C, Office of Commercial Programs. Code C will provide appropriate code contacts within NASA to address particular technical needs.

For further information contact Peter Eaton, Code M at (202) 453-1486 or Ray Whitten, Code C at (202) 453-1888.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 85:**
NASA Goddard Space Flight Center should facilitate the establishment of generic standards and interface requirements for Space Station robotics and tools. (Pg. 291, Par. 12)

**Response:**
NASA will design all robotic systems incorporating standard interfaces. These standards will be documented in the program requirements document and based on the mission requirements established for robot systems expected to be completed with phase B in one year.

For further information, contact Greg Swietek at (202) 453-2869.

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**Item # 86:**
The Ground Services subpanel will develop a proposal and present it to OCP by June 15, 1988, regarding functions which could be privatized and agreements which must be formalized regarding activity operations, takeover, liability, and other matters. (Pg. 291, Par. 13)

**Response:**
NASA/OCP looks forward to receipt of the Ground Services subpanel proposal for consideration. It is hoped that the proposal will focus on long range goals, specific requirements, and potential candidates. Please submit the proposal to Jack Yadvish, Code CC NASA Headquarters or contact him at (202) 453-1893.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 87:**
NASA needs to develop a ship-based platform launch facility. (Pg. 290, Par. 11)

**Response:**
A ship-based platform launch facility is an interesting concept, and one that has been tried before. The problem with a ship-based launch system is that it is economically infeasible. Although it would provide a great deal of flexibility in launch locations, a ship used for simple systems would have low usage, based on current estimates, compared to the operations and maintenance costs associated with the ship. For more complex launch systems, the cost of the ship itself would be difficult to justify.

If market demand increased in favor of ship borne launches making this type of system economically feasible, then NASA would consider this type of development.

Another commercial opportunity may exist in the area of tracking and telemetry. As TDRSS takes over this role for NASA, NASA will close several of its down-range tracking and telemetry stations. If a market were to exist for a non-TDRSS tracking and telemetry service aimed at supporting low technology or more routine missions, commercial or otherwise, this service could be provided commercially. A company could take over operation of the facilities or develop a fleet of mobile tracking and telemetry systems that can be deployed to a variety of non-U.S. launch sites or down range activities.

For further information, contact Peter Eaton at (202) 453-1486.

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

### ON-ORBIT SERVICES

**Item # 88:**
What will the commercial entity own and how can they control their assets once they are part of the Space Station? (Pg. 284,Par. 3)

**Response:**
NASA recognizes the fundamental concern that industry has over ownership and control of commercially developed and/or operated hardware.

We will address this issue as part of our Space Station infrastructure contract and will make the results available upon completion.

For further information, contact Kevin Barquinero at (202) 453-2863.

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**Item # 89:**
Will U.S. regulatory restrictions on ownership apply? (Pg. 284, Par. 3)

**Response:**
The issue of U.S. regulatory restrictions aboard the Space Station is one that extends beyond NASA's control. We will, however, study this concern as part of our contract that will be in place by March 1988 and forward recommendations to the appropriate agencies. For further information, contact Kevin Barquinero at (202) 453-2863.

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**Item # 90:**

Will NASA support third party liability insurance? (Pg. 284, Par. 3)

**Response:**
The new executive space policy and commercial space initiative recommends limiting third party liability for noneconomic loss to $200,000. This new executive policy will require legislation to be put into effect. It is currently NASA's policy to indemnify all third party liability for middeck payloads or R&D cargo bay payloads from the first dollar. This policy does not hold true for commercial cargo bay payloads. It is expected that commercial cargo bay payloads self insure or buy insurance up to a negotiated threshold above which NASA will indemnify. This threshold would be negotiated based on the nature of the cargo and the ability of the firm to pay for its own insurance.

This issue is currently unsettled. NASA is addressing this issue examining the legal limits of liability. For additional information, contact Jack Yadvish at (202) 453-2103.

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**Item # 91:**
Will safety/performance codes and standards be established and implemented?

**Response:**
Yes, at a minimum, current shuttle standards will apply. New standards applying solely to the Space Station will be prepared and disseminated when they become available.

For further information, contact Richard Storm at (202) 453-1589.

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**Item # 92:**
Will there be safety standardization? (Pg. 284, Par. 3)

**Response:**
Yes, uniform standards will be prepared by the Office of Safety, Reliability, Maintainability, and Quality Assurance. Contact Richard Storm at (202) 453-1589 for further information.

**Item # 93:**
Will penalties for nonperformance of commercial services and NASA service be set to cover a supplier unable to deliver due to a situation beyond his control? (Pg. 284, Par. 3)

**Response:**
NASA will not be liable to a commercial supplier of services where NASA fails to provide services, e.g., due to a NASA power supply failure. NASA will also not be liable to the user of the commercial supplier for such a failure. The commercial contract between the commercial supplier and the commercial user should address the liability of the commercial supplier to that user.

In the development of the Space Station reimbursement policy, it is expected that NASA will address to what extent and at what cost to the commercial supplier NASA should provide repeat services made necessary because of NASA's prior failure.

For further information, contact Bob Wojtal at (202) 453-2446.

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**Item # 94:**
What price will commercial ventures pay for NASA provided services? Who will be appointed as the regulatory/controlling agency, both domestically and internationally? (Pg. 284, Par. 3)

**Response:**
NASA understands the importance of a clearly defined pricing policy to allow industry to adequately plan. NASA is in the process of developing a policy addressing the pricing strategies for standard and optional station services. This analysis will encompass all aspects to include the polar platform, transportation and communication. The results of this analysis are due to Congress by September 30, 1988. The regulatory/controlling agency for Space Station commercial activity will be determined as the requirements are more clearly defined. For further information contact Richard Halpern at (202) 453-1181.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 95:**
Who will be appointed as the regulatory/controlling agency, both domestically and internationally? (Pg. 284, Par. 3)

**Response:**
NASA will build, control, and plan the evolution of the Space Station for the next 30 years. Input to this process should be directed to Kevin Barquinero, NASA Office of Space Station, NASA Headquarters, or contact him at (202) 453-2863.

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**Item # 96:**
How will OMB Circular A-76 tax and accounting procedures apply? (Pg. 284, Par. 3)

**Response:**
OMB Circular A-76 will not apply to commercial space activities requiring system integration or that impact the safety or function of the system. This circular is based on a straight line cost/benefit analysis for routine operations such as security or mail room services.

Space Station service operations proposed by commercial vendors are welcomed and will be examined on a case by case basis. This policy is consistent with the President's policy on Space Station privatization where NASA will "seek to rely to the greatest extent feasible on private sector design, financing, construction, and operation of future Space Station requirements, including those currently under study." However, OMB Circular A-76 will not contribute to the analysis of any proposals presented for services to be determined as critical or requiring extensive integration.

For further information, contact Charles Tulip at (202) 453-2210.

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**Item # 97:**
Modify government purchase regulations or federal laws to fully fund multiyear contracts and provide acceptable termination protection to help promote long-term contracts. (Pg. 284, Par. 4)

**Response:**
When full funding is not available for start contracts extending beyond the fiscal year in which awarded, they may then be incrementally funded. This method of contract funding is subject to Federal Acquisition Regulation (FAR) Subpart 32.7 and NASA FAR Supplement Subpart 18-32.7. An incrementally funded contract may provide a funding schedule and contains a Limitation of Funds clause. The clause provides for the contractor to notify the contracting officer in time for funds to be added before they are needed.

Termination protection is provided under the Limitation of Funds clause and the Termination for the Convenience of the Government clause. Under these clauses contractors are only obligated to perform up to the point where available funds would cover incurred costs, a fee or profit on the work done, and the costs of termination.

The regulations cited are based on the Anti-Deficiency Act, 31 U.S.C. 1341, which prohibits any officer or employee of the government to create or authorize an obligation in excess of the funds available, or in advance of appropriations. The Office of Management and Budget for many years has attempted to convince Congress to provide longer term appropriations to facilitate the acquisition process. Congress has been unwilling to do so.

For further information, contact Bud Maraist at (202) 453-2105.

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**Item # 98:**
Develop an accounting analysis system to provide for "true" comparisons in the government's make or buy decision. (Pg. 284, Par. 4)

**Response:**
NASA fully supports this request and stresses the need for the government to be consistent in its analysis of make or buy decisions. The Office of Commercial Programs will examine the existing system and identify methods for improvement. For further information, contact Jack Yadvish at (202) 453-2103.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item # 99:**
Provide a zoning commission to handle system integration for add-on or growth services. (Pg. 284, Par. 4)

**Response:**
The role of zoning commission will be handled by the Office of Space Station Strategic Plans and Programs Division. They will manage the evolution of the Space Station with Langley Research Center having technical responsibility.

Contact Kevin Barquinero for more information at (202) 453-2863.

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**Item # 100:**
Establish a mechanism to announce available opportunities in order to sustain competition for service franchise. (Pg. 284, Par. 4)

**Response:**
This issue will be addressed as part of the Space Station infrastructure contract. Results will be disseminated at the earliest possible date. For more information contact Kevin Barquinero at (202) 453-2863.

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**Item # 101:**
Offer proper franchise control. (Pg. 284, Par. 4)

**Response:**
This issue will be addressed as part of the Space Station infrastructure contract. Results will be disseminated at the earliest possible date. For more information, contact Kevin Barquinero at (202) 453-2863.

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# SPACE STATION WORKSHOP

## RECOMMENDATIONS/ISSUES RESPONSE WORK SHEET

**Item #: 102**

Extend space patent laws to more than 17 years. (Pg. 284, Par. 4)

**Response:**

This can only be done by amending Title 35 of the U.S. Code which is under jurisdiction of the Senate and House Judiciary Committees. Past attempts to extend the patent term have been highly political and controversial and have taken years to go through the process. The United States Patent and Trade Office would probably oppose the idea because it would disrupt efforts to harmonize patent laws on an international scale. This would be much better pursued by private initiative to the committees. For further information, contact Bob Kempf at (202) 453-2424.

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